STATE & PRIVATE FORESTRY
FOREST HEALTH PROTECTION
SOUTH SIERRA SHARED SERVICE AREA

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From: State and Private Forestry, Forest Health Protection, South Sierra Shared Service Area

Subject: **Forest Health Assessment of Wrights Creek HFR Project, 2016**

Summary: Wrights Creek HFR Project was initiated in response to significant widespread tree mortality due to bark beetles and ongoing drought in California. The Wrights Creek project will be implemented as a categorical exclusion under HFRA Section 602(b)(1) of the 2014 Farm Bill. Project objectives are to reduce current stocking levels in mature pine plantations and neighboring natural stands to lower densities that are more resistant to bark beetle attack but also improve resiliency against other disturbance agents. This reports discusses current bark beetle situation in the Forest, and management plans of the project.

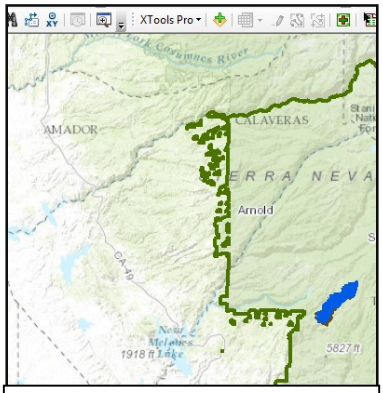

Figure 1. General location of Wrights Creek project (in blue) on Stanislaus NF.

Introduction

Since 2011, California is in the midst of a historical drought event. Exceptionally low Palmer Drought Severity Indexes of 2012-2015 are considered unprecedented in terms of their severity over the past 10,000 years (Robeson 2015). As a consequence of drought stress and warmer summer temperatures, forests are under increasing risk of catastrophic wildfire and widespread bark beetle mortality. The high level of bark beetle-associated mortality occurring in Stanislaus National Forest is not unique, but widespread throughout southern Sierra Nevada and southern California (FHM Aerial Detection Survey, May 2016). Bark beetle associated-mortality is most notable in pine-dominated forests, with the highest levels of mortality occurring in the lower ranges of ponderosa pine. Natural stands and plantations are losing nearly all age classes of pine as beetles select weakened host trees. White fir and incense cedars are now succumbing in higher elevation mixed-conifer stands due to drought and other forest pests. Dramatic changes are seen in many locations on Stanislaus National Forest and surrounding private lands, particularly campgrounds and homesteads that have few but cherished high-value trees. The Forest is taking a proactive approach to mitigating further mortality while still striving for ecological restoration and healthy forests.

Figure 2. Representative plantation of proposed treatment unit in Wrights Creek Project.

Background.

2016 Wrights Creek Plantation Healthy Forest Restoration project area is located in Tuolumne County, Mi-Wok Ranger District, Stanislaus National Forest (Figure 1). Elevations within the project area range from 4,072 ft. to 6,345 ft. The Wrights Creek HFR project area burned in September 1950, converted to Jeffrey and ponderosa pine plantations between 1952 and 1960. The plantations are predominantly 50-60 year old, even-aged Jeffrey and ponderosa pines which have been previously thinned commercially and prescribed burned (*Project Initiation Letter*, March 10, 2016). Current stocking averages 200 trees/acre, with average diameters of 12-25 inches, stand density indexes >230 (Baker 2016). Tree canopies overlap, and understory vegetation comes into contact with lower branches. Plantations have minimal diversity and structure, despite natural regeneration of white fir, incense cedar, black oak, and Douglas-fir trees in the understory (see Figure 2).

The purpose and need of Wrights Creek project is to create resilient and resistant forests to reduce the potential for undesirable losses due to bark beetles and/or catastrophic wildfires. Current basal areas within proposed units range from 130 to 295; post-treatment conditions would average basal area below 140 ft^2acre (Baker 2016) which is sufficient to reduce risk from bark beetles (Oliver 1995). Thinning prescriptions should significantly improve air flow through units, and redistribute limited resources to residual trees, reducing initial attraction of invading beetles to the area. Proposed treatments (commercial thinning, mastication, manual thinning) are planned to restore current conditions in plantations and natural stands to more historical conditions: higher structural heterogeneity of different age and species classes of both trees and shrubs, variable gap openings, and variable spacing based on topographic location.

Current Situation

According to recent Forest Health Monitoring Aerial Detection Surveys (2013-2015)[1], overall bark beetle-associated mortality has been continuous and intensifying in various locations throughout Stanislaus National Forest. Tree decline has been most severe below 5000 feet in elevation, where pine is dominant, and stands are often overstocked. Mortality has been significant: a polygon as large as 4000 acres was detected near Star Ridge (Mi-Wok RD) with an estimated average of 25 trees killed per acre earlier this year (FHM 2016). Other identified patches in the Forest with high mortality due to bark beetles have been as large as 500 acres, with estimates of 5-25 attacked trees/acre (FHM 2016). Additionally, ponderosa pines on drier aspects or lower-elevation oak-brush vegetation are completely infested around Mount Provo. In 2015, multiple patches of up to 50 dead trees were observed as well as other scattered mortality of white fir and sugar pines in neighboring stands within and around Wrights Creek project boundary (see Appendix A).

Figure 3. View looking south into the Basin, Mi-Wok RD.

Pine plantations have been hardest hit by western pine beetle (*Dendroctonus brevicomis*) due to their high proportions of even-aged host trees with heavy stocking. WPB has targeted and thrived in these areas: stand basal areas >120 ft^2acre, >50% host composition, and diameter average of 13 inches or greater (Oliver 1995). Group kills in young plantations (regarded at lower risk due to smaller diameters) are now showing signs of severe infestation (ex: China Flat, Groveland RD) by western pine beetle, mountain pine beetle (*Dendroctonus ponderosae*), and pine engravers (*Ips spp*). Infestations in older plantations (near Deer Flat and Anderson Meadow) of Groveland Ranger District have also experienced near loss that has been ongoing since 2014. Mortality in pine plantations in the Basin have been building since 2012. Commercial private plantations further down the hillside from Wrights Creek project have been especially hit, with new groups of mortality coalescing with old dead (see Figure 3).

Other tree species in the Forest have been declining rapidly as drought persists, particularly sugar pine, white fir, and incense cedar. Mountain pine beetle has continued to pick off large diameter sugar pines for the past decade. Mortality is often not noticeable due to the scattered nature of sugar pines but ground observations and ADS have found large groups of mortality occurring at now alarming rates in the Sierras. On Sierra NF, 17% of dead trees are sugar pines while 51% are ponderosa pines, both of which are observed trees >15 inches DBH (Rojas 2015). The continual loss of sugar pine seed source in many locations will require active management to restore them. Fir engraver (*Scolytus* spp.)-associated mortality will often increase when at least two or three consecutive years of below-average precipitation occur in California (Felix et al. 1971, Guarin and Taylor 2005). True firs appear to succumb quickly to bark beetles when drought events hit – particularly those on drier sites or with prior disease infection. Thereby, mortality of true fir is not surprising when droughts occur; unfortunately it is now compounded with large amounts of pine and cedar. Incense cedar is considered drought, insect, and disease hardy as it has very few disturbance agents that significantly affect it. However, the severity of the drought and current overstocked conditions of many forests have

[1] *The recent Aerial Detection Survey (conducted in May 2016) did not cover the Wrights Creek HFRA Project area, but is scheduled for flight late summer 2016.*

finally pushed incense cedars past its tolerant limits. Increasing infestations by woodborers and cedar bark beetles (*Phloeosinus spp*.) have been detected in dead and dying trees throughout the county. Outbreaks of cedar bark beetles killing otherwise healthy trees has been documented but still remains uncommon (Punches 2003). Punches (2003) noted that trees occurring on dry sites in association with oak, or areas with high vegetation competition were more often selected by beetles.

Outbreaks of Jeffrey pine (*Dendroctonus jeffreyi*) beetle are uncommon on the western slopes of the Sierra Nevada; activity is more notable on xeric sites, like those found on eastside forests. However, precipitation limitations will eventually affect trees in higher elevations, and insects will seek out vulnerable hosts if available. Jeffrey pines on Inyo and Sequoia National Forests have been detected with increased levels of mortality since 2012, caused by combinations of flatheaded borers, pine engravers, and Jeffrey pine beetle. As with incense cedars, if Jeffrey pine trees become significantly weakened they will be susceptible to pests that do not often rise to epidemic levels.

Discussion

Tree mortality is expected to continue regardless of whether or not adequate precipitation returns to the region this winter. Current drought monitors show southern Sierra Nevada in "exceptional" drought conditions and persisting into 2017 (http://www.cadrought.com/drought-monitor/). The severity and prolonged nature of the drought will require several consecutive years of above-normal rainstorms for forest trees to regain vigor and rebuild sufficient resistance against bark beetles. Infestation pressure of western, mountain, and even Jeffrey pine beetle are expected to be fairly high based on the widespread fading of recently killed trees within and surrounding the project area. Current year successful attacks may not yet have changed color, thereby mortality estimates may be higher than previously observed.

Undesirable levels of tree mortality and substantial site alteration are highly probable if high risk sites are left untreated. While trees have varying levels of resistance and resilience to withstand drought conditions, high levels of mortality could still occur as beetles build up populations that can overwhelm even vigorous trees. The potential for catastrophic wildfire actually increase years later as dead trees eventually fall and regeneration fills in, all of which become heavy fuel loads (Jenkins et al. 2008). Tt is imperative that prescribed fires be conducted very cautiously or even postponed in these areas until precipitation improves that residual trees will not undergo further mechanical injury.

Forest Health Protection supports Wrights Creek Plantation HFRA project and Mi-Wok Ranger District in its proactive efforts to implement long-term prevention treatments against bark beetles, but also incorporating objectives to develop healthy forests. Land managers should continue to prioritize green areas of highest risk, but also expect that scattered mortality will continue as long as susceptible trees are available for attack. Reduction of stocking and competition still promote healthy forests despite times of low precipitation (Fettig et al. 2007, Egan 2010). Thinning in high risk green stands is strongly encouraged to reduce the possibility for complete tree loss as has been witnessed on other locations on the Forest.

If there are further questions or concerns regarding this report, please do not hesitate to contact Forest Health Protection.

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References

Baker, J. 2016. *Wrights Creek Plantations, Silviculture Report, August 4, 2016.* Mi-Wok Ranger District, Stanislaus National Forest, California.

Egan, J., W.R. Jacobi, J.F. Negron, S.L. Smith, and D.R. Cluck 2010. *Forest Thinning and subsequent bark beetle-caused mortality in Northeastern California.* Forest Ecology and Management 260 (10): 1832-1842**.**

Felix L.S., B. Uhrenholdt, and J.R. Parmeter Jr. 1971. *Association of Scolytus ventralis and Phoradendron bolleanum subspecies Pauciflorum on Abies concolor.* Canadian Entomologist, Vol 103: 1697 – 1703.

Fettig, C., K. Klepzig, R.F. Billings, A.S. Munson, T.E. Nebeker, J.F. Negron, and J. T. Nowak 2007. *The effectiveness of vegetation management practices for prevention and control of bark beetle infestations in coniferous forest of the western and southern United States*. Forest Ecology and Management 238: 24-53.

Forest Health Monitoring, 1994-2016 Aerial Detection Surveys. USDA Forest Service, Region 5, State and Private Forestry, Davis, CA.

Guarin, A. and A. Taylor 2005. *Drought triggered mortality in mixed conifer forests in Yosemite National Park, California, USA.* Forest Ecology and Management 218:229-244.

Jenkins, M.J., L. Hebertson, W. Page, and C.A. Jorgenson 2008. Bark beetles, fuels, fires and implications for forest management in the Intermountain West. Forest Ecology and Management, 254: 16–34

Oliver, W. W. 1995. *Is Self-thinning in Ponderosa Pine ruled by Dendroctonus Bark Beetles?* In Proceedings of 1995 National Silvicultural Workshop, GTR-RM-267, USDA Forest Service, Forest Service, Rocky Mountain Research Station, Fort Collins, CO. Pgs 213-218.

Punches, J. 2003. *Cedar and Redwood Bark Beetles in Southwest Oregon.* Oregon State University, Douglas County Extension Office, Roseburg, Oregon.

Robeson, S. M. 2015. *Revisiting the recent California drought as an extreme value.* American Geophysical Union, Geophysical Research Letters 42: 6771–6779.

Rojas, R. 2015. *Preliminary Results of Intensity and extent of Insect Mortality on the Sierra National Forest.* October 2015, Presentation. USDA Forest Service, Sierra National Forest, High Sierra Ranger District.

Wrights Creek Plantations Healthy Forest Restoration, Project Initiation Letter, March 2016. USDA Forest Service, Stanislaus National Forest, Sonora, California.

Appendix A. 2015 Aerial Detection Survey of observed multiple groups of tree mortality within and surrounding Wrights Creek Plantation HFRA project.